

What is claimed is:

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1. A method for forming a capacitor electrode of a capacitor in a reacting chamber,
the method comprising:
forming a first HSG nuclei by introducing a first amount of a source gas into the
reacting chamber while an ambient temperature stabilizes within a first temperature range;
forming a second HSG nuclei over the first HSG nuclei by introducing a second
amount of the source gas into the reacting chamber after the ambient temperature
stabilizes within the first temperature range to form a resulting structure; and
annealing the resulting structure.

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2. The method according to claim 1, wherein the second amount of the source gas
is larger than the first amount of the source gas.

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3. The method according to claim 2, wherein the first amount of the source gas
is less than 5 sccm.

4. The method according to claim 1, wherein an internal pressure of the reacting chamber is less than 1×10^{-3} torr during the formation of at least one of the first HSG nuclei and the second HSG nuclei.

5. The method according to claim 1, wherein the resulting structure is formed on a conductive layer pattern on a substrate and the ambient temperature is stabilized at the first temperature range by heating the substrate at a temperature between 500°C and 630°C .

6. The method according to claim 1, wherein the first temperature range of the ambient temperature is between 200°C to 500°C .

7. A method for depositing a hemispherical grain layer over a conductive layer pattern of a capacitor electrode on a substrate in an ambient for forming a semiconductor capacitor comprising:

introducing a first amount of a source gas into the ambient to form a first plurality of hemispherical sections while a temperature of the substrate stabilizes within a first temperature range;

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7 introducing a second amount of the source gas into the ambient to form a second
8 plurality of hemispherical sections over the first plurality of hemispherical sections after
9 the temperature of the substrate stabilizes to form a resulting structure; and
10 annealing the resulting structure.

1 8. The method according to claim 7, wherein the first temperature range is between
2 500 °C and 630 °C.

1 9. The method according to claim 7, wherein radii of a hemispherical section from
2 the first plurality of hemispherical sections are smaller than radii of a hemispherical
3 section from the second plurality of hemispherical sections.

1 10. The method according to claim 7, wherein the first amount of source gas is less
2 than the second amount of source gas.

1 11. The method according to claim 7, wherein an internal pressure of the ambient
2 is less than 1×10^{-3} torr.

1 12. The method according to claim 7, wherein the source gas comprises at least
2 one of SiH_4 and Si_2H_6 .

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2 13. The method according to claim 7, wherein heat radiating from the substrate
3 stabilizes the ambient while a temperature of the substrate stabilizes within a first
temperature range. B4

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2 14. A method for forming a capacitor electrode of a capacitor in a reacting
chamber, the method comprising:

3 forming a first HSG nuclei by introducing a first source gas into the reacting
4 chamber during a period while an ambient temperature stabilizes at a first temperature
5 range;

6 forming a second HSG nuclei over the first HSG nuclei by introducing a second
7 source gas into the reacting chamber after the period while an ambient temperature
8 stabilizes at a first temperature range to form a resulting structure; and

9 annealing the resulting structure.

1 15. The method according to claim 14, wherein an amount of the first source gas
2 is less than an amount of the second source gas.

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